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ABSTRACT

The Cooperative Extension Service faces the challenge of helping United States farmers and ranchers use microcomputers in managing their farms. Farm management extension education programs are delivered to farmers and ranchers through such activities as (1) local meetings and workshops organized by county agents and producer advisory groups, (2) regional meetings, (3) published information in the farm press or from the extension communication divisions, (4) radio and television, and (5) limited use of computer networks. A majority of the agricultural clientele for on-farm microcomputers have looked to the Cooperative Extension Service for guidance on software and hardware purchasing. Extension services provide this information through large regional meetings, smaller in-depth courses, and the development and distribution of software, particularly decision aid software or software to address specific problems. Part-time consultants in finance, computing, and other fields are used to help farmers gain more farm management skills using microcomputers. The future role of on-farm microcomputer extension programs will focus on user education and the use of electronic technology to access relevant information more effectively. The farm management extension specialist will play a major role in defining needs, designing systems, and providing educational support. Extension programs will focus on describing decision processes and information needs and communicating these to researchers and software developers. (KC)

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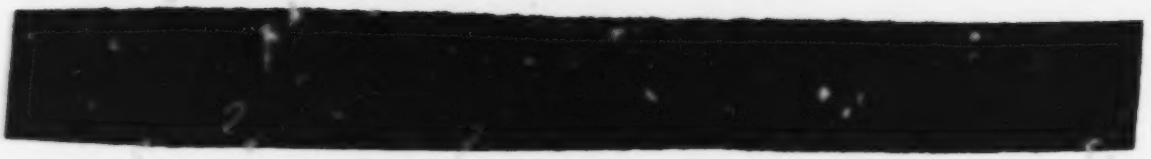

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Farm Management Extension Programs and the Use of Microcomputers on Farms

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Farm Management Extension Programs and the
Use of Microcomputers on Farms

The Cooperative Extension Service faces a much greater challenge in facilitating the adoption of computer technology on U.S. farms than with previous innovations such as hybrid seed, fertilizer and pesticides. These technologies required only research and extension efforts to demonstrate production advantages and the farmer's decision to purchase and use. Buy hybrid seed and plant it; test the soil and apply the right amount of fertilizer; buy a pesticide, set the sprayer and apply at the right rate and time. A step or two and the technology pays off.

On-farm computer technology is different in that it is a tool that extends the human mind, cutting the time and effort necessary in certain information management and analysis jobs, supplying some of the logic needed in the organization and evaluation of management data and, in general, encouraging the manager to reach for new levels of understanding. This push for new management frontiers among farmers is a necessarily complicated process, requiring that farmers and their would be advisors learn the mechanics of an ever-changing computer technology and move into new levels of information management and problem solving analysis. The educational needs and patience requirements are very high.

The knowledge level and dedication of the user determines the potential contribution of computer tools to farm profitability. Extension education programs are being challenged to increase the managerial skills of farmers and ranchers in the U.S. to profitably use microcomputer technology. With all its recognized limitations, there is no other technology that offers greater potential to facilitate the transition of agriculture to the more business

management orientation necessary to operate in the current U.S. agricultural economic environment than the on-farm computer with appropriate software and farmers adequately trained in its use.

No profession in the United States has so widely supported the use of microcomputers on-farm than the farm management extension profession. This paper reviews the organization of their professional extension activities, the characteristics of clientele using microcomputers on-farms, and specific farm management extension programs that support microcomputer use on U.S. farms and ranches.

Organization of Farm Management Extension

The farm management extension programs in the United States address farm and ranch level educational needs for using and understanding economics and finance principles and analytical tools. These extension programs are implemented primarily by professionals trained in agricultural economics and finance that also have a strong technical knowledge of production agriculture. Educational activities are implemented through local extension support (county agent) to farmers, ranchers and agribusiness. The farm management extension specialists are most frequently located at each state's land grant institutions, or in decentralized extension regional offices in each state. These professionals are supported by researchers and extension specialists in farm management, production economics, finance, marketing and policy specialists. A group of extension management specialists also work in farmer accounting and advisory cooperatives called farm business associations where producers pay for the services provided. The associations are particularly strong in the midwestern U.S. The final level of coordinated support is at the federal level. The Federal Extension Service facilitates communication between states and regions, and implements special programs that support

multi-state activities. In total, there are approximately 400 farm management extension professionals in the United States, which include approximately 100 professionals with the farm business associations.

Farm management extension education programs are delivered to farmer and rancher clientele through a number of activities including: (1) local meetings and workshops organized by county agents and producer advisory groups, (2) regional meetings that serve a larger audience, (3) published information in the farm press or from the extension communication divisions, (4) radio and television and (5) limited use of computer networks. Much of the support for computer applications comes through software development and support, as will be described later. Farm management extension economists support other agriculture disciplines and play a major role in extension staff education. Much of the direct communications activity of extension farm management professionals with clientele is through use of the telephone. One-on-one or individual farm consultation is very limited, relative to other forms of education and information delivery. This is due primarily to the limited number of professionals as compared to a large numbers of producers. Many extension management education programs are directed to the private farm accountants, lenders, lawyers, tax preparers and other agribusiness firms that support agriculture. With increased use of these specialized off-farm agricultural services, the importance and effectiveness of this type education activity is increasing.

Characteristics of On-Farm Computer Users

The primary clientele for the current on-farm microcomputer use are commercial farms with an annual gross sales in excess of $100,000.[2] Studies by Yarbrough in Iowa in 1982 indicated that the first agriculture producers to adopt the on-farm microcomputers were characterized as being younger individuals with more formal education, higher farm income and more advanced agricultural management practice (innovators), and had used computers in an on-farm environment. Another key to successful computer use on many farms is the involvement of the farm wife, particularly in the time consuming tedious data entry activity for accounting or record keeping. The first microcomputers were brought by innovative farmers or ranchers for on-farm use four to five years ago in the U.S. Current estimates indicate that approximately six to eight percent of all farms presently have microcomputers. The farms that have microcomputers account, however, for a larger proportion of the value of farm sales since 13% of the large farms (gross sales in excess of 100,000) account for 73% of the total sales in the U.S.

Although the total potential audience for profitable use of on-farm and ranch computers has not been determined by a research study, the total numbers are probably not more than 300,000, which is a relatively small portion of the 2.2 million farms and ranches. Even in the larger farm category many farmers are not among the prospective users of on-farm computers. Many are older and do not have the patience and energy required to learn effective computer use. Others have well established, profitable businesses needing few adjustments. Some do not have the educational background to effectively apply computers and

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[2] Based on the 1982 Census of Agriculture, farms with a gross income of $100,000 or more represented about 300,000 farms or about 13.5% of U.S. farms. This group, however, accounted for nearly 73% of cash receipts and 98% of net farm income. Many of the 2.2 million U.S. farms had a negative net farm income in 1982. (Office of Technological Assessment)

are more prone to meet computer needs with off-farm services such as accounting. However, partially making up for the loss of these larger scale farmers are some part-time farmers who will purchase computers for use in the off-farm business as well as the farm.

Many state extension services have microcomputers in county offices that can meet limited microcomputer needs of farmers.[3] State such as South Carolina which have placed microcomputers in all their extension offices have found that the microcomputer offers a new vehicle and an enormous challenge in building effective extension teaching teams. The extension workers face a more complicated task than the farmers, for they must learn to use computers and often bring very detailed information and narrowly specialized people together in a integrated way to answer real time questions. This challenge is a welcome one however, for computer are devices that have the potential to unite the intelectual efforts of educational specialists in ways that could make land grant universities much more effective. Just as farmers, university professionals need to get their information management and delivery systems upgraded to function in the modern world.

Lenders and agribusiness firms are increasingly making microcomputer services available (e.g. ration formulation programs widely provided by feed manufacturers and accounting systems by lenders) to farmers and ranchers.

Changing Economic Decision Environment

U.S. agriculture is presently in the worst economic situation since the great depression. Net farm income has declined more than 50 percent since 1981. Never has the value of economics, finance and more precise information

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3 All states have microcomputers in some county offices. In states with microcomputers, a limited portion of their use is directed at one-on-one clientele needs in farm and ranch management.

be so important for management in American agriculture. Agriculture is moving into an age of increased value for information in decision making and substitution of information for agricultural inputs (pesticides, machinery, etc.). More complete and precise information increases the efficient use of production inputs and the awareness of the economic and financial implications of input usage. The microcomputer is increasingly being recognized as the tool that will facilitate on-farm data generation and processing of data into useful information for farm decision makers.

To fully realize the potential of the on-farm computer requires appropriate hardware and software. Most important, however, is the education of users on how to effectively use the computer as a management tool. U.S. farmers, ranchers and extension staff are much more knowledgeable about production agriculture than the economic, finance and general business management sides of farming. This limits the ability of producers and extension staffs to cope with the economic crisis in agriculture. This also affects the rate of adoption of microcomputer technology. However, the current climate in farming gives farm management specialists, using microcomputers, a rare opportunity to interest and teach new business skills to farmers, farm wives and other agricultural production specialists.

The use of computers in farm management is not new with the development of microcomputers. In the late sixties, mainframe time share computer systems such as TELPLAN at Michigan State University were developed. Several other states have similar computerized time-share systems. In the late seventies, applications of the programmable calculator were developed for agriculture. With the development of the microcomputer technology, however, there was a tremendous increase in computer capabilities at a lower cost, which is having a much greater impact on the on-farm computer use. This paper is limited to discussion of microcomputers and does not address the farm management

extension programs supporting ongoing computer application efforts using mainframe computer systems or programmable calculators. However, use of this technology is relatively low at the present time.

Current Farm Management Extension Programs

Software and Hardware Selection

A majority of the agricultural clientele for on-farm microcomputers have looked to the Cooperative Extension Service for education on what software and hardware to purchase. This necessity arose because of the lack of clientele experience in computer use, software and hardware being made available from a large number of sources, non-standardization and the dynamic change in the hardware technology. One of the primary roles of the Extension Service has been to provide the objective educational information on software and hardware to agriculture producers. This need was fulfilled in many states under the leadership of farm management extension specialists due to their training in computer applications and many applications focusing on using computers to facilitate economic and financial management decision making and farm accounting activities.

Examples of current educational activities include national or state wide seminars sponsored by the extension services in Iowa, Florida, Oklahoma, Indiana, Illinois, Missouri, and regional and county level seminars held in nearly every state. These multi-day conferences cover general topics on computer use, defining needs and demonstrations of specific applications in short concurrent sessions. Private vendors normally are involved by demonstrating their products to clientele. Audiences for the educational programs include farmers, ranchers, extension and research staff, educators (high school and college level), agribusiness, and computer software and hardware vendors.

Indepth Subject Matter Education Efforts

The format of continued educational meetings that focused on using computers in economics and finance management will trend toward more indepth education on specific applications which concentrate on a narrow set of topics rather than many concurrent sessions. There will be more emphasis on teaching such subject matter as economic analysis, accounting, whole farm financial analysis and planning, etc. that is necessary to fully use the software. The short current session, focusing on single specific topics used in earlier computer use education efforts, was not adequate to meet clientele indepth educational needs in economics and financial management. There will be more education programs on a continuous basis rather than focusing on a one time or two hour meeting approach.

An example of a program meeting the needs of farmers for indepth education is the "Year 2000 Computerized Farm" being implemented by the Texas Agricultural Extension Service and Texas Agricultural Experiment Station of the Texas A&M University system. This project is supported by a three year, $500,000 grant from the W. K. Kellogg Foundation, a $300,000 hardware grant from Texas Instruments Incorporated, the Stiles Farm Foundation, numerous grants from agriculture software vendors, and a tractor from the John Deere Company. The project involves development of a computerized information system that is demonstrated on a large commercial sized farm (3300 acres). In addition to having microcomputer applications demonstrated at the farm, there is also a training center used by farmers, ranchers and extension staff, and a software library for evaluation of private and public software. Short courses held in the training center deal with specific topics (farm and ranch accounting, beef cattle performance records, etc.) and run for three day periods. The facility offers an opportunity to apply and demonstrate on-farm

microcomputer technology and indepth continued education required for full realization of the potential of the on-farm computer. The project also demonstrates how public and private interest can be served by joining in developing computer application efforts that will facilitate adoptive research and user education.

Software, Development, Distribution and Support

The key to any successful area of on-farm computer use is the availability of appropriate software. Currently, the private agriculture software vendors supply and support much of the agricultural software available to U.S. farmers and ranchers. Much of this software utilized analytical procedures and software that was developed earlier by the land grant institutions. The majority of the private sector software vendors design, program, distribute and support clientele as a multi-business function. The private agriculture software sector has been somewhat plagued by overestimation of market demand and higher than expected support cost that has resulted in poor economic performance and a rapid turnover of firms. The high cost of software development and marketing (approximately $200,000 for a complete farm accounting package) has also restricted the area where private firms can profitability develop and market software. Farm management extension programs aimed at educational use and software evaluation have been a major supporter of the agriculture software industry.

To meet needs where private firms cannot profitability develop and market software, most Extension Services develop and distribute software, particularly decision aid software or software for minor commodities to address specific problems (e.g., financial analysis, cost analysis, marketing strategy). There also is an important role for the public development of software where interdisciplinary teams of specialist must do the research and

develop the analytical procedures to generate relevant software designs that can be used by the private sector. Most of this work is available to the public so if a vendor sees a market potential situation, the software or analytical procedures can be acquired for commercial use.

Many states now use the electronic spreadsheet as an important media to develop and deliver decision aid types of software. This is a lower cost means of software development (much less than programs written in languages) and very appropriate as most on-farm computer systems have the spreadsheet software.

State farm management programs where microcomputer software development and distribution have been an important activity include Texas, Florida, Mississippi State and Iowa to identify a few. The reference list identifies software catalogs from these states.

The financial support for software development and distribution comes from a number of sources other than from individual state revenues. A description of a limited number of these activities facilitates the understanding of this type of support.

The W. K. Kellogg Foundation has historically been the largest private foundation supporter of computer use in U.S. agriculture. The Foundation's initial effort started at Michigan State University twenty years ago with TELFARM, a farm management mainframe based effort. In the past twenty years, the Kellogg Foundation has financed computer application efforts in agriculture in excess of 11 million dollars. Many of the extension computer applications for farms and ranches funded by the Kellogg Foundation are directed by farm management extension economist in U.S. land grant universities.

The federal level of the Extension Service has facilitated software development efforts that have capabilities for nationwide use. This includes

the development of microcomputer software for evaluation of crop insurance, a cooperative effort with the Federal Crop Insurance Cooperation and several land grant institutions, and the development of FINPAK, a financial consultation program developed at the University of Minnesota. Both of these recent efforts were products of farm management extension programs.

State and regional cooperative efforts also support software development. An example of this activity is the Soil Conservation Service support of range improvement analysis software at Texas A&M University.

Farm management extension programs have supported private sector computer use newsletters, an important media information delivery to U.S. farmers and ranchers. [Doane-Western]

Identification of software sources and their evaluation is an important extension farm management activity supported by on-farm computer use. Ongoing work done by Strain in Florida, with support by the Federal Extension Service, is an example of this activity where over 2000 different programs available in land grant institutions were identified. Activities at the regional centers supported by the W. K. Kellogg Foundation and cooperating states are expanding the information flows on software availability in both the public and private sectors. Evaluation of software has become a focus of the activity at the Northeast Computer Institute. This activity includes both subject matter and computer programming technique education. Software evaluation is a growing area of responsibility of the farm management profession, and is an important extension program activity supporting clientele needs.

One-on-one Extension programs

The Cooperative Extension Service's ability to serve individual producers on an individual basis is very limited for economics and financial analysis due to the large number of producers relative to the professional staff. Given

that the Extension Service is a public service institution, it is beyond its scope of responsibility to provide indepth individual assistance on farm management problems to all producers. There are several extension programs, however, to support one-on-one efforts.

Farm management extension programs have helped organize and support associations of producers that pay professionally trained specialist to perform one-on-one consultation. These farm business associations are particularly large in the midwest (Iowa, Illinois, Nebraska, Kentucky and Kansas) where farms are similar in size and commodities produced. Nearly all these programs, historically, centered on building analytical skills and basic financial awareness through computerized accounting. The programs also seek to broaden analysis activities.

An example of a one-on-one farm management extension program to respond to the present economic crisis to improve financial analysis and planning in Iowa, Minnesota, Nebraska, Kansas and Missouri. This program is implemented with a set of microcomputer programs developed at the University of Minnesota (FINPAK). The financial consultation effort has reached approximately 11,000 farm families in the past year, many who were experiencing severe financial problems. This activity was implemented by specially hired paraprofessionals, county agents and farm management extension specialists that had indepth training programs in finance and use of the finance software. In most situations, the farmer pays part of the program cost. This activity demonstrates how the computer and software can be used to implement extension programs for many farmers who lack the subject matter knowledge to effectively utilize the tool. Implementations of this program required some creative ways through training, existing staff and hiring additional part-time help to meet a one-on-one producer consultation need.

A large amount of individual farm management planning is accomplished

where groups of farmers participate in workshops which often span over several days. In many states, microcomputers are utilized to encourage and assist producers to complete their farm plans during the workshop. In some cases the workshops may be followed up with one-on-one visits to the farm by extension staff.

Future Role of On-Farm Microcomputers

The future role of on-farm microcomputer extension programs will focus on the education of users to improve subject matter and the use of electronic technology to more effectively access relevant information. The current cost of a microcomputer system ($4,000-$8,000) is not prohibitive for commercial farms. Computer use skills can be acquired and newer computer software requires less time and operational skills than in the past. The limitation, however, will be the lack of ability for the farm and ranch managers to effectively apply the information to improve decision making. New computer information technologies that are still in the development stages should facilitate overcoming the knowledge level limitations on microcomputer use. A laser disk with a very large storage capacity has the potential to provide on-line video support to meet educational information needs while users are running a particular computer application. Artificial intelligence or expert systems that are incorporated into computer systems will replace the necessity of much of the expert or one-on-one consultation.

The use of all forms of telecommunications will facilitate acquisition of off-farm information, enabling farmers to have a world of information at their fingertips. However, the most important management data and information will always be generated at the farm level.

Software and hardware must evolve to facilitate "whole farm" analysis that allows for better incorporation of risk, marketing, government policy and financial management. This calls for an interdisciplinary approach and a

clearer understanding of the decision process and information needs. This will be an impossible task without the use of computer technology.

Data generation and maintenance is a major task for on-farm computerized information systems. The use of microcomputers to automate the data generation with monitors, controllers and communication technology will be increasingly important.

There are many opportunities to be realized in the area of microcomputer use by county agents to improve their ability to meet modern agriculture business management education needs. This will require retraining, redefining of job responsibilities and time to do one-on-one work, if it is to contribute to this need, especially for farmers that for various reasons do not have access to microcomputers or knowledge to effectively use them.

In all these new areas of development, the farm management extension specialist will play a major role in defining needs, designing systems and providing educational support. Extension programs will focus on describing decision processes and information needs, and communicating these to researchers and software developers. The information age will increase the relative importance of the management on farms and the professionals that support the activity.

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